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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/035,400	10/26/2001	Koji Yoshida	P/1071-1505	3376

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EXAMINER	
RUGGLES, JOHN S	
ART UNIT	PAPER NUMBER
1756	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/035,400	YOSHIDA ET AL.
	Examiner	Art Unit
	John Ruggles	1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 February 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicants' submission filed on 11 February 2004 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brebels, et al. (US Patent 5,675,295) in view of Kornrumpf, et al. (US Patent 5,355,102), further in view of Carey, et al. (US Patent 5,219,787), further in view of Ohya, et al. (US Patent 5,686,172), and further in view of at least one of: Trinh, et al. (US Patent 5,132,648), Peterson (US Patent 5,574,415), and/or Kroger (US Patent 4,490,733).

Brebels teaches a microwave or millimeter wave (milli-wave) oscillator device (interpreted as a module) usable in a receiver, transmitter, transceiver, or other electronic component and a method of manufacturing the device (module, column 1, lines 7-11). The

transceiver (also interpreted as a module) is designed for compactness (including a thin film circuit board having a pattern area of 5 cm^2 or less) and robustness (column 4, lines 35-37). The method includes forming a first metal (conductor film) on a substrate in a predetermined pattern by lift-off technology (column 8, lines 11-12). Lift-off technology is understood to mean that a resist is patterned on the substrate, the metal conductor film is formed over the patterned resist and substrate, followed by removal of the resist along with overlying portions of metal conductor to form the patterned metal conductor film. Column 8, lines 20-35 describe forming and patterning a photosensitive or non-photosensitive organic insulation layer (film of, e.g., polyimide, photosensitive benzocyclobutene (photo-BCB), etc.) up to 10-20 microns (μm) thick to cover the metal conductor film. TiW/Au/TiW and Au are used as metal conductor film materials (column 8, lines 49-59). According to column 19, lines 22-44, thin film technology may be used to form an antenna; multiple layers of low dielectric loss (insulation layer) materials are built up (e.g., spun on, etc. – photo-BCB having a thickness in the range of 1-50 μm) to form an insulating film; and metal (e.g., Ti/Cu/Ti, etc.) layers are deposited (formed, e.g., by vaporization, etc.) on the substrate and patterned by conventional methods. Portions of a low dielectric constant (non-photo-sensitive organic insulating film) not covered by a patterned patch or feed line (not masked) are removed by dry etching (column 19, lines 66-67, instant claim 3). If photosensitive, the low dielectric constant material is spun (formed) 20 μm thick onto a substrate (of high dielectric material having a metal conductor film formed thereon), baked by a hot plate, exposed to a pattern, developed, and baked (or cured, column 20, lines 1-6, instant claim 2). Note that by applicant's own admission on instant page 5, polyimide and benzocyclobutene inherently have stresses in the range of 15-60 MPa. Therefore, Brebels

inherently teaches an insulating film stress in this range (as recited in instant claim 1) by teaching the use of these insulating film materials (e.g., polyimide, benzocyclobutene, etc.).

While teaching the other limitations of instant claims 1-3 as discussed above, Brebels does not teach: (1) cleaning a ceramic substrate (as the high dielectric substrate) having a thickness of 0.05-2 mm and a flexural strength of 500-4000 kgf/cm^2 before coating and (2) alternatively forming the conductor film from at least one of Ag, Ni, Cr, Al, Nb, and/or V.

Kornrumpf shows a microwave thin film circuit having a ceramic (e.g., alumina, etc.) substrate, which is 25-100 mils (0.635-2.54 mm) thick and reads on the 0.05-2 mm thick ceramic substrate of instant claim 1. The 12.5-75 μm thick polyimide insulating film reads on the 20 μm or greater thickness insulating film of instant claim 1. A conductor film is patterned either (1) while being deposited or (2) first deposited as a continuous layer and then patterned by etching through a patterned resist layer (column 1, lines 28-60 and column 4, lines 6-43). Additional dielectric layers of polyimide or polyimide epoxy blend are formed over the earlier polyimide insulating film (column 10, lines 14-20 and column 11, lines 56-50). The microwave thin film circuit made by this method has a high density interconnect structure formed in a manner that provides close impedance matching, minimizes impedance discontinuities, and substantially increases the yield of good circuits (abstract).

Carey describes a process of trenching to form channels, vias, and components in a substrate, including a thin film circuit board or a high density multichip module (understood to include a waveguide, column 1, lines 50-59). The process includes cleaning an alumina ceramic substrate before coating with a polyimide insulating layer to assure acceptable contamination removal and coating adhesion (column 2, line 58 to column 3, line 4).

Ohya discloses a process of making a metal-foil-clad composite ceramic board (interpreted as a thin film circuit board) having greatly improved flexural strength applicable to a variety of fields where the excellent properties (e.g., physical, dielectric, etc.) of ceramic are essential (column 1, lines 1-28). The process of making the ceramic board includes curing the resin in a 0.1-6 mm thick resin-impregnated sintered ceramic substrate (column 5, lines 29-30), which reads on the 0.05-2 mm thick ceramic substrate of instant claim 1. Preferably, the flexural strength is at least 40-50 MPa (408-510 kgf/cm^2 *or greater*), because a 1 mm thick substrate having a flexural strength less than 40 MPa (408 kgf/cm^2) would be fragile, in which cracking is liable to occur during handling or processing (column 5, lines 56-60 and column 11, lines 3-15). This encompasses the flexural strength range of 500-4000 kgf/cm^2 recited in instant claim 1. Specific examples of flexural strength for the composite ceramic substrate ranging from 46-181 MPa (469-1846 kgf/cm^2) are shown in Tables 1, 6-1, and 6-2 found in columns 33 and 41. The metal for the foil is selected from copper (Cu), aluminum (Al), nickel (Ni), or various combinations of these metals (column 20, lines 42-49, for Ni (understood to include Ni-Cr alloy) and/or Al of instant claim 1).

Trinh teaches a monolithic microwave integrated circuit (MMIC, used as a microwave module for radio frequency communication) made with a circuit of highly conductive material (e.g., Ag, etc.) patterned on an insulating ceramic (e.g., alumina, etc.). This microwave integrated circuit has increased thermal stability and reduced mechanical stress (column 3, lines 5-55).

Peterson shows a multilayer microwave structure (understood to be a circuit) made by building up sequentially patterned metal (e.g., Cu, Cr, Al, etc.) and insulating layers of epoxy or

polyimide using standard resist patterning with or without lift-off (abstract and column 4, lines 36-57).

Kroger describes millimeter wave and microwave detectors and mixers (again, understood to be circuits) having patterned conductor electrode layers made with superconducting metal alloy of a refractory metal (e.g., Nb, V, etc.) coated on insulating layers (column 4, lines 52-54, column 6, lines 36-37, and column 9, lines 33-40).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to carry out the photolithographic process of making a microwave or milli-wave module (or circuit) as taught by Brebels using a ceramic (e.g., alumina, etc.) substrate 25-100 mils (0.635-2.54 mm) thick (which reads on the 0.05-2 mm thick ceramic substrate of instant claim 1) as shown by Kornrumpf in order to form a high density interconnect structure in a manner that provides close impedance matching, minimizes impedance discontinuities, and substantially increases the yield of good circuits. In addition, it would have been obvious to clean the alumina (dielectric) ceramic substrate before coating with a polyimide insulating film to assure acceptable contamination removal and adhesion of the coating, as described by Carey. It would also have been obvious to use a ceramic substrate having a flexural strength of at least 408 kgf/cm^2 to avoid cracking of the substrate or circuit during handling or processing as disclosed by Ohya. This encompasses the flexural strength range of 500-4000 kgf/cm^2 recited in instant claim 1.

Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to manufacture the microwave circuit as taught by Brebels (Cu, Au, or Ti), Kornrumpf, Carey, and Ohya (Cu, Ni, Ni-Cr, or Al) using a conductor film made from at least

one metal selected either from those already listed or alternatively from the following: Ag (taught by Trinh), Cr (shown by Peterson), Nb, and/or V (described by Kroger). This is because Brebels, Kornrumpf, Carey, Ohya, Trinh, Peterson, and Kroger all relate to the same art of circuit manufacture. This combination encompasses instant claim 1 for a conductor film including at least one selected from Cu, Au, Ag, Ni, Cr, Al, Ti, Ni-Cr, Nb, and/or V.

Response to Arguments

Applicants' arguments filed 11 February 2004 have been fully considered but they are not persuasive.

On pages 4-5, Applicants dispute the meaning for compactness illustrated by Brebels' first embodiment. While Brebels' Figure 1 cannot be relied upon for exact dimensions of the circuit pattern, column 6 lines 14-17 give typical dimensions of 0.3 mm x 0.5 mm (0.03 cm x 0.05 cm = 0.0015 cm^2) for the microstrip closed loop line 4. The dimensions for other portions of the circuit pattern were not specified, but the express dimensions for the microstrip closed loop line suggest at least the *approximate scale* for the Brebels compact circuit and insulator patterns, which reads on the instant area range of 5 cm^2 or LESS (emphasis added). Therefore, one of ordinary skill in the art would consider Brebels' design for "compactness" to at least include insulating film areas that overlap the instant area range of 0-5 cm^2.

Applicants assert on page 5 that the multiple layers of low dielectric material (e.g., photosensitive BCB, etc.) described at column 19 lines 25-39 of Brebels were built up first, then patterned together in a single patterning step. However, column 19 lines 37-39 specify the thickness "d2" of a single layer of low dielectric photo-BCB to be in the range of 1-50 μm (e.g.,

d2 = 20 μm, etc.) and column 20 lines 4-7 describe patterning of a single layer of low dielectric material that is 20 μm thick. This suggests that each 20 μm thick low dielectric layer was deposited and patterned separately. Repeating these steps successively would result in building up the multiple layers of low dielectric material.

In response to Applicants' argument on page 6 that the examiner has combined an excessive number of references, reliance on a large number of references in a rejection does not, without more, weigh against the obviousness of the claimed invention. See *In re Gorman*, 933 F.2d 982, 18 USPQ2d 1885 (Fed. Cir. 1991). The reasons for combining each of the references set forth above has remained the same throughout prosecution, as recorded in previous Office actions. Applicants have failed to present convincing evidence refuting these reasons for combining the references, so these same reasons have again been maintained.

In response to Applicants' argument on page 7 that the Examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the Applicants' disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

For at least these reasons, instant claims 1-3 are still believed to be obvious variations in view of the previously cited art of record in this case. Therefore, the previous rejection over the same prior art still stands and has again been made FINAL.

Conclusion

All claims are drawn to the same invention claimed in the application prior to the entry of the submission under 37 CFR 1.114 and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the application prior to entry under 37 CFR 1.114. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action after the filing of a request for continued examination and the submission under 37 CFR 1.114. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Ruggles whose telephone number is 571-272-1390. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

John Ruggles
Examiner
Art Unit 1756

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